

# Planned angiography after percutaneous coronary intervention increased reinterventions but did not affect mortality or MI

ten Berg JM, Kelder JC, Suttorp MJ, Verheugt FW, Plokker HW. Influence of planned six-month follow-up angiography on late outcome after percutaneous coronary intervention. A randomized study. *J Am Coll Cardiol*. 2001 Oct;38:1061-9.

## QUESTION

In patients who have had percutaneous coronary intervention (PCI), what is the effect of planned follow-up angiography on late clinical outcome?

## DESIGN

Randomized {allocation concealed\*}†, blinded {data analysts and monitoring committee}†,\* controlled trial with follow-up at 1 and 3 years (a substudy of the Balloon Angioplasty and Anticoagulation Study [BAAS]).

## SETTING

A cardiology department at a hospital in The Netherlands.

## PATIENTS

1058 patients (mean age 60 y, 78% men) with symptomatic coronary artery disease who were referred by 7 participating hospitals for PCI. Exclusion criteria were acute myocardial infarction (MI), current use of oral anticoagulants, contraindications to coumarin or aspirin, or a bypass graft lesion. {Data from all patients were included in the 1- and 3-year analyses}†.

## INTERVENTION

531 patients were allocated to planned angiography at 6 months plus clinical follow-up, and 527 were allocated to clinical

follow-up only (angiography done at the discretion of the referring physician).

## MAIN OUTCOME MEASURE

A composite of death, MI, or revascularization (coronary angioplasty or coronary artery bypass surgery for restenosis or for new lesions) at 1 and 3 years.

## MAIN RESULTS

Analysis was by intention to treat. 51 patients (9.6%) allocated to angiographic follow-up did not have angiography, and 134 (25%) of those allocated to clinical follow-up only had angiography. At 1 year, patients in the angiographic follow-up group had higher rates of the composite end point and reinter-

vention than did those in the clinical follow-up group, but they did not differ for death or MI (Table). Results were similar at 3 years.

## CONCLUSION

In patients who had percutaneous coronary intervention, planned angiographic follow-up at 6 months increased rates of revascularization but did not affect the incidence of death or myocardial infarction at 1 or 3 years.

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\*See Glossary.

†Information provided by author.

## Angiographic vs clinical follow-up after percutaneous coronary intervention‡

Outcomes at 1 y	Angiographic follow-up	Clinical follow-up	RRI (95% CI)	NNH (CI)
Composite end point <sup>§</sup>	23%	17%	38% (8 to 76)	16 (10 to 68)
Revascularization	21%	13%	67% (27 to 121)	12 (8 to 25)
			RRR (CI)	NNT
Death	1.1%	1.1%	0.75% (-190 to 66)	Not significant
Myocardial infarction	3.2%	4.0%	20% (-49 to 57)	Not significant

‡Abbreviations defined in Glossary; RRI, RRR, NNH, NNT, and CI calculated from data in article.

<sup>§</sup>Death, myocardial infarction, or revascularization (coronary angioplasty or coronary artery bypass surgery for restenosis or for new lesions).

## COMMENTARY

Two findings of the study by ten Berg and colleagues will probably not surprise most practicing clinicians. First, a strategy of routine repeated angiography to detect restenosis after PCI led to a higher rate of reintervention than did clinical follow-up alone. This finding probably reflects the so-called "oculostenotic reflex" (1). Although revascularization was ostensibly based on the angiographic appearance of the vessel coupled with recurrent pain and objective evidence of ischemia, no details were provided. Furthermore, restenosis was not defined, and the authors did not report whether they compared the local clinicians' assessments of restenosis with the independent core angiographic laboratory results. Second, reintervention did not reduce the risk for death or MI over the next 1 to 3 years. Given that index PCIs do not reduce the "hard" end points of death or MI, why one would anticipate that reintervention for restenosis might do so is unclear. PCIs treat symptoms of angina and nothing more. Therefore, repeated angiography in response to symptoms and objective evidence of ischemia would seem to be the appropriate strategy.

Should routine angiography be done if stents were implanted? The answer would have to be "no." Stents have been shown to reduce the risk for restenosis. However, for the "softer" end point of repeated revascularization, unblinded trials may be biased by the knowledge that a stent has been implanted. Moreover, strong evidence is only available for stenting in patients having a procedure done to a single large (> 3 mm) vessel with a focal lesion (< 15 mm), to chronic total occlusions, or in saphenous vein grafts. Because of perceived safety, stenting has expanded beyond these indications, and any effect on repeated revascularization may be neutralized.

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## Reference

1. Topol EJ, Nissen SE. Our preoccupation with coronary luminology. The dissociation between clinical and angiographic findings in ischemic heart disease. *Circulation*. 1995;92:2333-42.